National Coastal Assessment in New Jersey

Year 2000 - Results and Assessment

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Marine Water Monitoring
Water Monitoring & Stds
NJ Dept. Env. Protection

www.nj.gov/dep/bmw

NCA Partners

- USEPA - Reg. 2, Monitoring & Assessment
- USEPA - Atlantic Ecology Division
- NJDEP - Water Monitoring & Standards
- Delaware River Basin Commission
- NJ Marine Sciences Consortium

Purpose of NCA

- to assess the ecological condition of estuarine resources
- determine reference conditions for ecological responses/stressors
- build infrastructure in states and EPA Regions for making assessments of coastal water quality

Approach

- Probabilistic survey
  - Extrapolates to all of resource
  - 100% assessed waters (Integrated Assessment)
  - Incorporates many existing monitoring sites
- Response indicators to assess ecological condition
- Diagnostic indicators to help explain condition

Core Indicators

Physiochemical
Temperature
Salinity
pH
Secchi depth
Water depth

Water Quality
Nitrogen species
Phosphorus species
Silica
Total suspended solids
Dissolved oxygen
Transmissometry

Sediment Quality
Metals
PAHs
PCBs
Sediment toxicity
Total organic carbon
Grain size

Living resources
Benthic community composition
Benthic community abundance
Fish community composition
Fish pathologies
Fish parasites
Fish tissue residue
Chlorophyll *a*
Occurrence of exotic species

Habitat
Occurrence of SAV
Occurrence of macroalgae
Habitat type delineation
Qualitative abundance of SAV
Qualitative abundance of macroalgae

Probability-Based Designs
Stratified Random Sampling

- Define population (spatial area) about which to make statements
- Population (spatial area) can be divided into strata
- Describe entire area by sampling finite number of locations
- Grid overlay allocates samples spatially
- Level of uncertainty directly related to number of samples

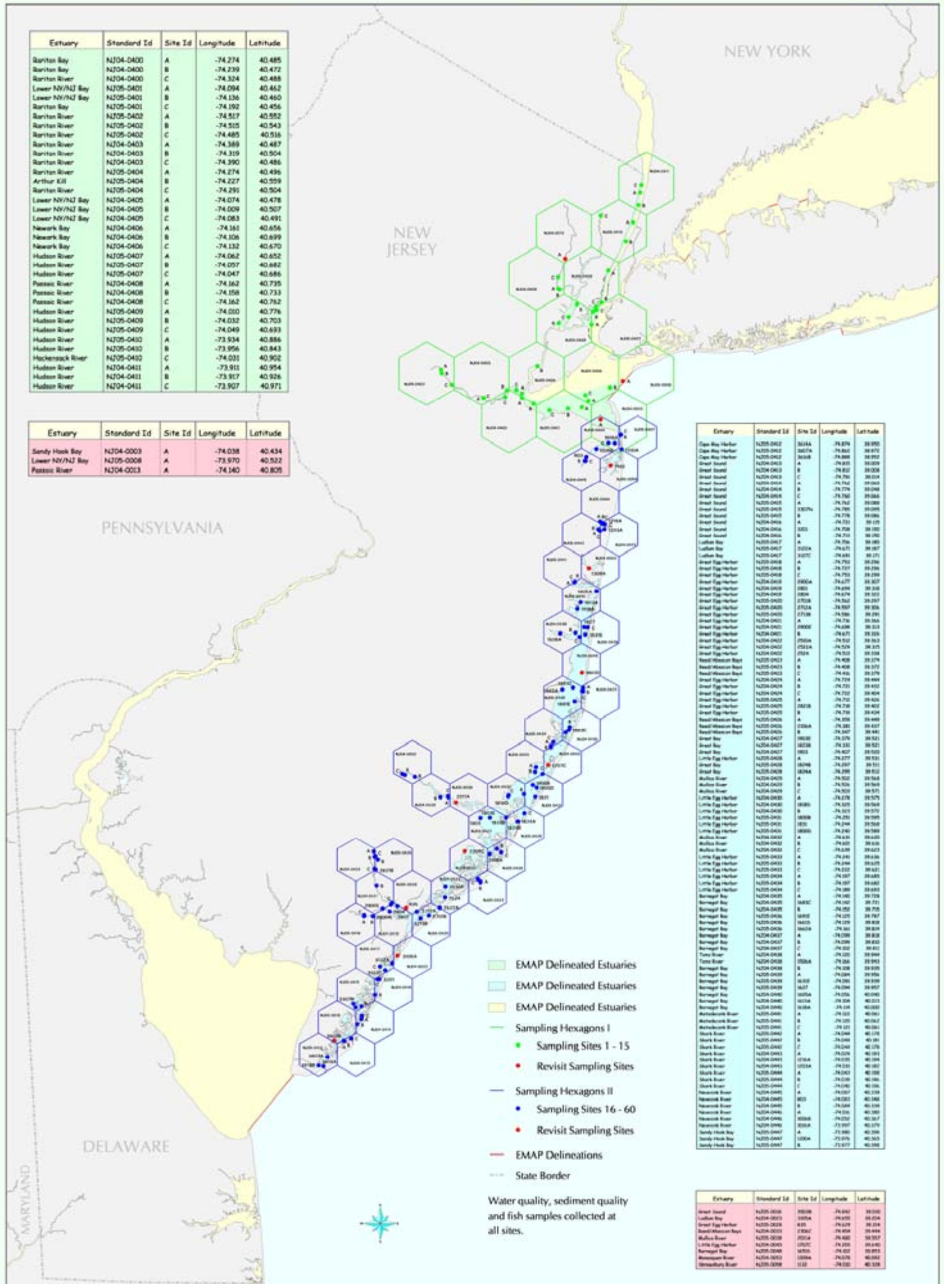
Design

- **Strata = Biogeographic province (10)**
- **Substrata = States (24)**
- **Minimum sites in state = 50**

NATIONAL COASTAL ASSESSMENT

New Jersey Sampling Sites 2004 - 2005

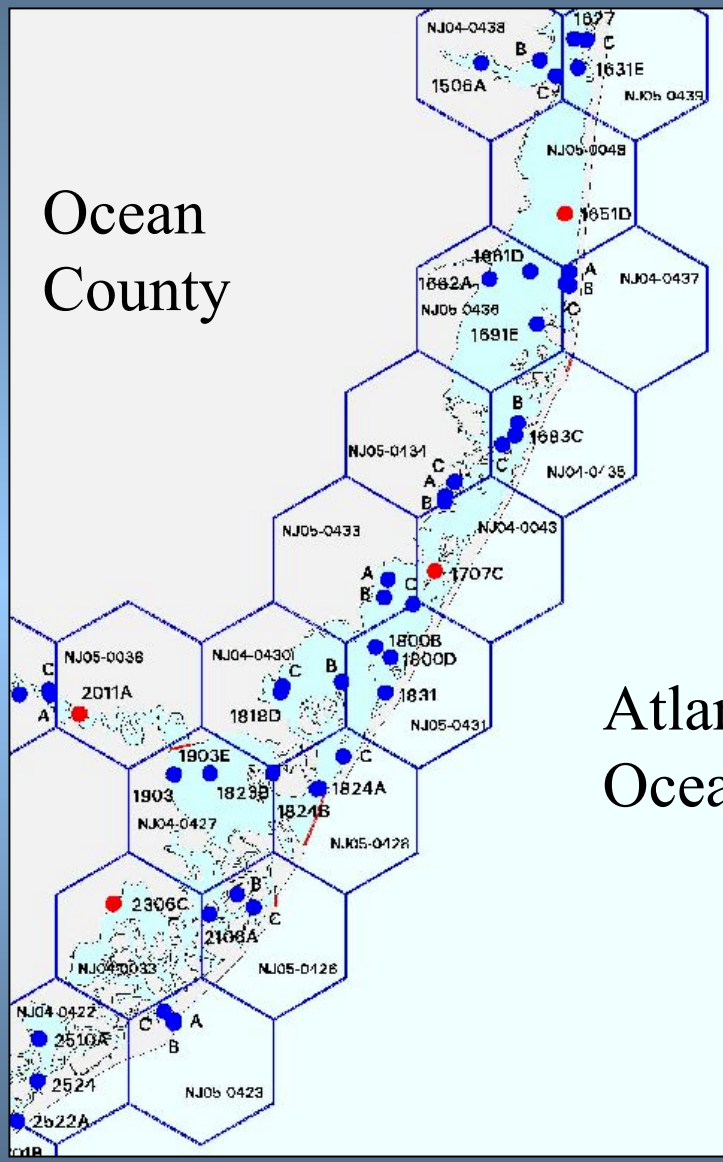
EPA
AED, Narragansett RI



Estuary	Standard Id	Site Id	Longitude	Latitude
Raritan Bay	NJ04-0400	A	-74.274	40.485
Raritan Bay	NJ04-0400	B	-74.239	40.472
Raritan River	NJ04-0400	C	-74.324	40.488
Lower NY/NJ Bay	NJ05-0401	A	-74.094	40.462
Lower NY/NJ Bay	NJ05-0401	B	-74.136	40.460
Raritan Bay	NJ05-0401	C	-74.192	40.456
Raritan River	NJ05-0402	A	-74.517	40.552
Raritan River	NJ05-0402	B	-74.515	40.543
Raritan River	NJ05-0402	C	-74.485	40.516
Raritan River	NJ04-0403	A	-74.389	40.487
Raritan River	NJ04-0403	B	-74.319	40.504
Raritan River	NJ04-0403	C	-74.390	40.486
Raritan River	NJ05-0404	A	-74.274	40.496
Arthur Kill	NJ05-0404	B	-74.227	40.559
Raritan River	NJ05-0404	C	-74.291	40.504
Lower NY/NJ Bay	NJ04-0405	A	-74.074	40.478
Lower NY/NJ Bay	NJ04-0405	B	-74.009	40.507
Lower NY/NJ Bay	NJ04-0405	C	-74.083	40.491
Newark Bay	NJ04-0406	A	-74.161	40.656
Newark Bay	NJ04-0406	B	-74.106	40.699
Newark Bay	NJ04-0406	C	-74.132	40.670
Hudson River	NJ05-0407	A	-74.062	40.652
Hudson River	NJ05-0407	B	-74.057	40.682
Hudson River	NJ05-0407	C	-74.047	40.686
Passaic River	NJ04-0408	A	-74.162	40.735
Passaic River	NJ04-0408	B	-74.158	40.733
Passaic River	NJ04-0408	C	-74.162	40.762
Hudson River	NJ05-0409	A	-74.010	40.776
Hudson River	NJ05-0409	B	-74.032	40.703
Hudson River	NJ05-0409	C	-74.049	40.693
Hudson River	NJ05-0410	A	-73.934	40.886
Hudson River	NJ05-0410	B	-73.956	40.843
Hackensack River	NJ05-0410	C	-74.031	40.902
Hudson River	NJ04-0411	A	-73.911	40.954
Hudson River	NJ04-0411	B	-73.917	40.926
Hudson River	NJ04-0411	C	-73.907	40.971

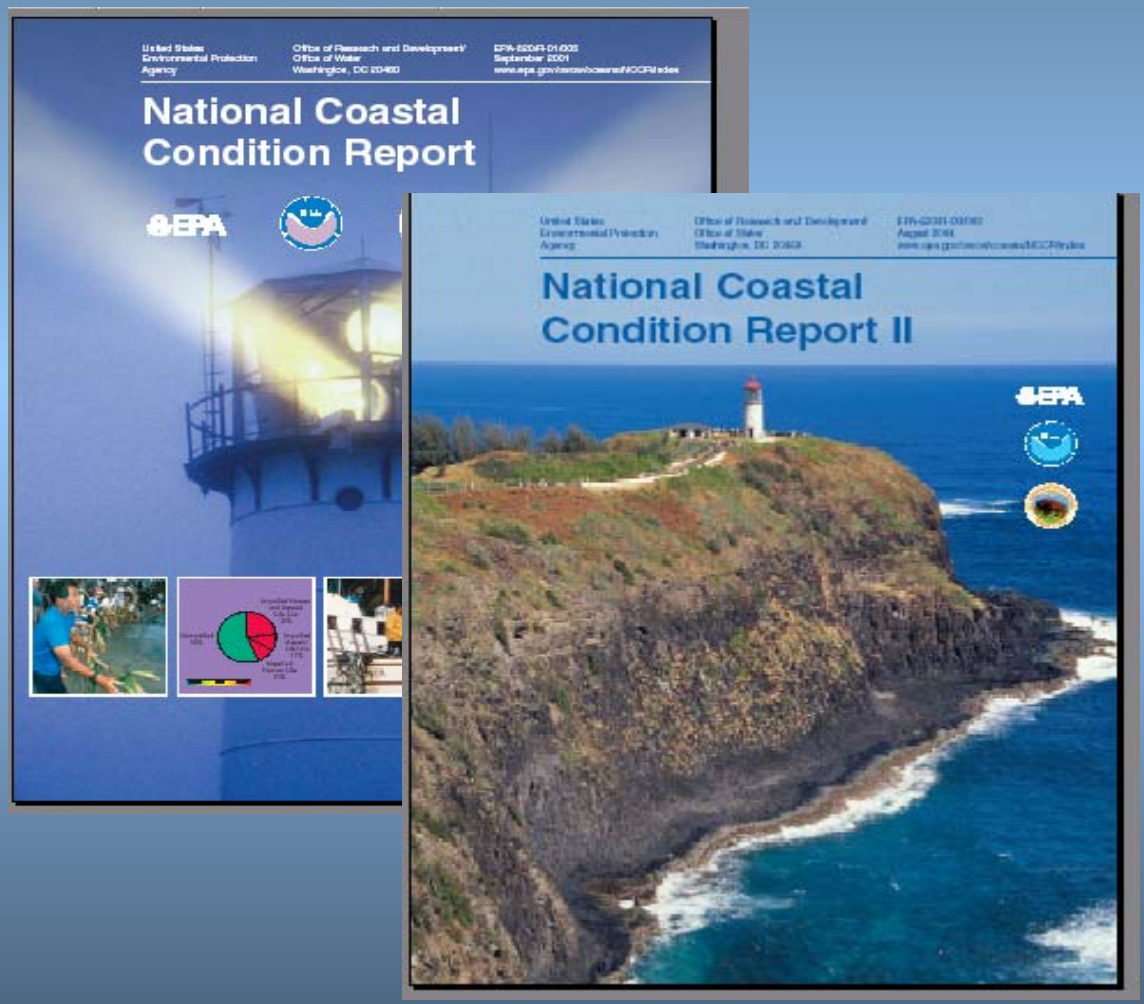
Estuary	Standard Id	Site Id	Longitude	Latitude
Sandy Hook Bay	NJ04-0003	A	-74.038	40.434
Lower NY/NJ Bay	NJ05-0008	A	-73.970	40.522
Passaic River	NJ04-0013	A	-74.140	40.805

Probabilistic Design - NJ Waters



Great Egg Harbor	NJ04-0421	A
Great Egg Harbor	NJ04-0421	2900E
Great Egg Harbor	NJ04-0421	B
Great Egg Harbor	NJ04-0422	2510A
Great Egg Harbor	NJ04-0422	2522A
Great Egg Harbor	NJ04-0422	2524
Reed/Abescon Bays	NJ05-0423	A
Reed/Abescon Bays	NJ05-0423	B
Reed/Abescon Bays	NJ05-0423	C
Great Egg Harbor	NJ04-0424	A
Great Egg Harbor	NJ04-0424	B
Great Egg Harbor	NJ04-0424	C
Great Egg Harbor	NJ05-0425	A
Great Egg Harbor	NJ05-0425	2821B
Great Egg Harbor	NJ05-0425	B
Reed/Abescon Bays	NJ05-0426	A
Reed/Abescon Bays	NJ05-0426	2106A
Reed/Abescon Bays	NJ05-0426	B
Great Bay	NJ04-0427	1903E
Great Bay	NJ04-0427	1823B
Great Bay	NJ04-0427	1903
Little Egg Harbor	NJ05-0428	A
Great Bay	NJ05-0428	1824B
Great Bay	NJ05-0428	1824A
Mullica River	NJ04-0429	A
Mullica River	NJ04-0429	B
Mullica River	NJ04-0429	C
Little Egg Harbor	NJ04-0430	A
Little Egg Harbor	NJ04-0430	1818D
Little Egg Harbor	NJ04-0430	B
Little Egg Harbor	NJ05-0431	1800B
Little Egg Harbor	NJ05-0431	1831
Little Egg Harbor	NJ05-0431	1800D
Mullica River	NJ04-0432	A
Mullica River	NJ04-0432	B
Mullica River	NJ04-0432	C
Little Egg Harbor	NJ05-0433	A
Little Egg Harbor	NJ05-0433	B
Little Egg Harbor	NJ05-0433	C
Little Egg Harbor	NJ05-0434	A
Little Egg Harbor	NJ05-0434	B
Little Egg Harbor	NJ05-0434	C
Barnegat Bay	NJ04-0435	A
Barnegat Bay	NJ04-0435	1683C
Barnegat Bay	NJ04-0435	B
Barnegat Bay	NJ05-0436	1691E

Reports


National Coastal
Condition Report
National Coastal
Condition Report II

Draft National Coastal Condition Report II Released for Public Comment

The report is posted on the web at:

http://www.epa.gov/owow/oceans/nccr2/

Data are available at:

http://oaspub.epa.gov/coastal/coast.search

or

http://www.epa.gov/storet/dw_home.html

Water Quality

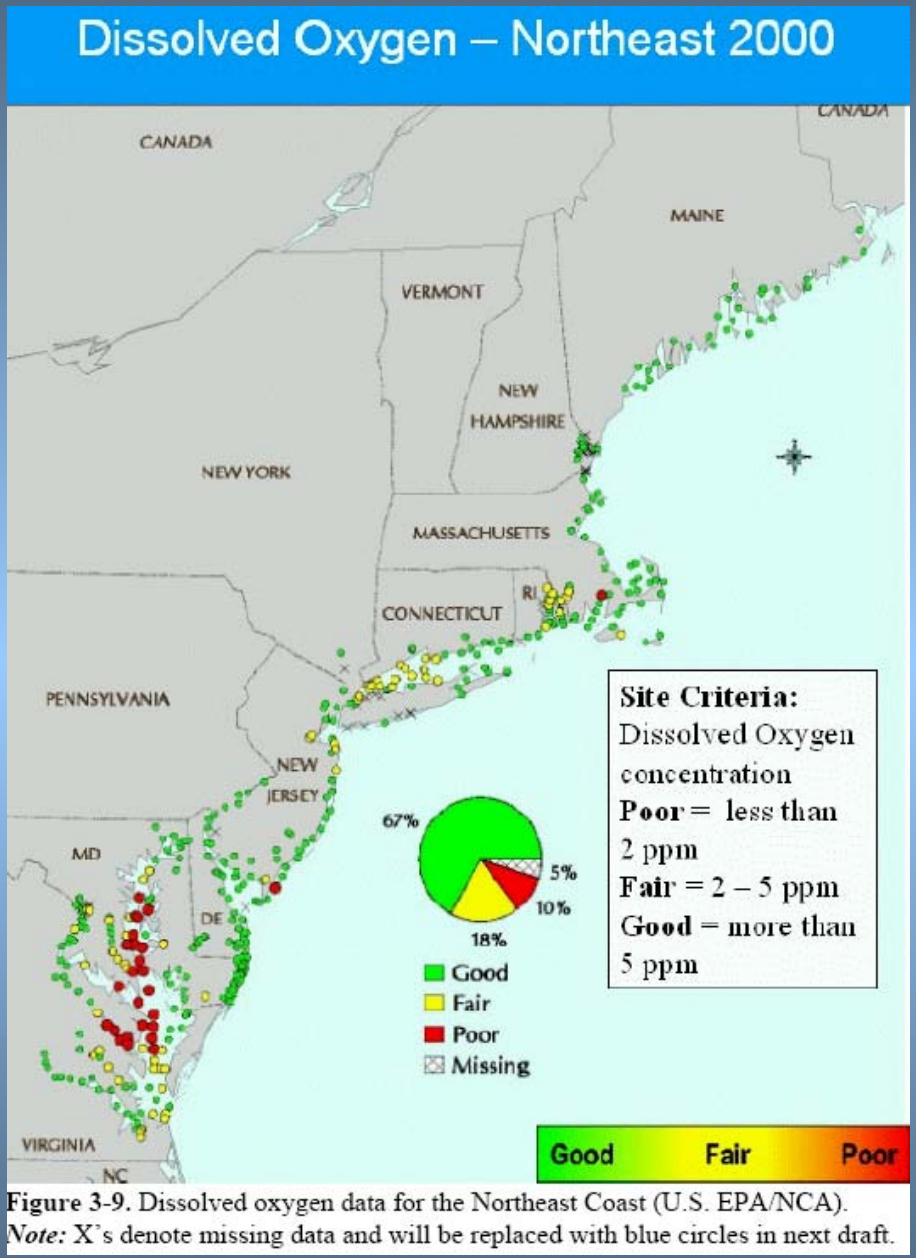


Figure 3-9. Dissolved oxygen data for the Northeast Coast (U.S. EPA/NCA).
Note: X's denote missing data and will be replaced with blue circles in next draft.

NCA data found that overall dissolved oxygen conditions in NJ's estuaries was good. Only one station was found to be below 2 PPM. That station is located in a poorly flushed man-made canal in Cape May County.

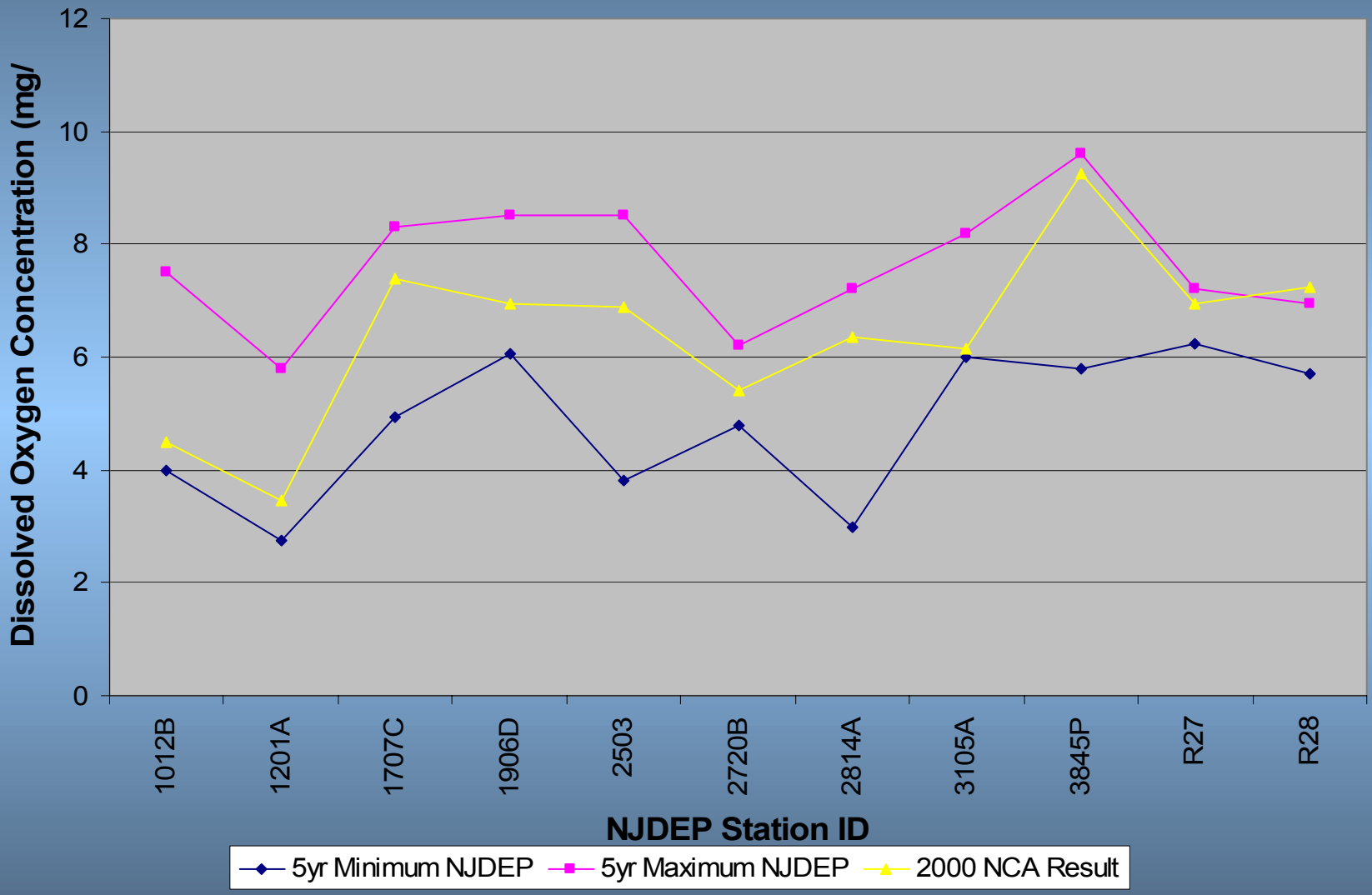
Tools

ArcExplorer Map

Excel Map

View Data

Surface Dissolved Oxygen Concentration NJDEP Data vs NCA Data



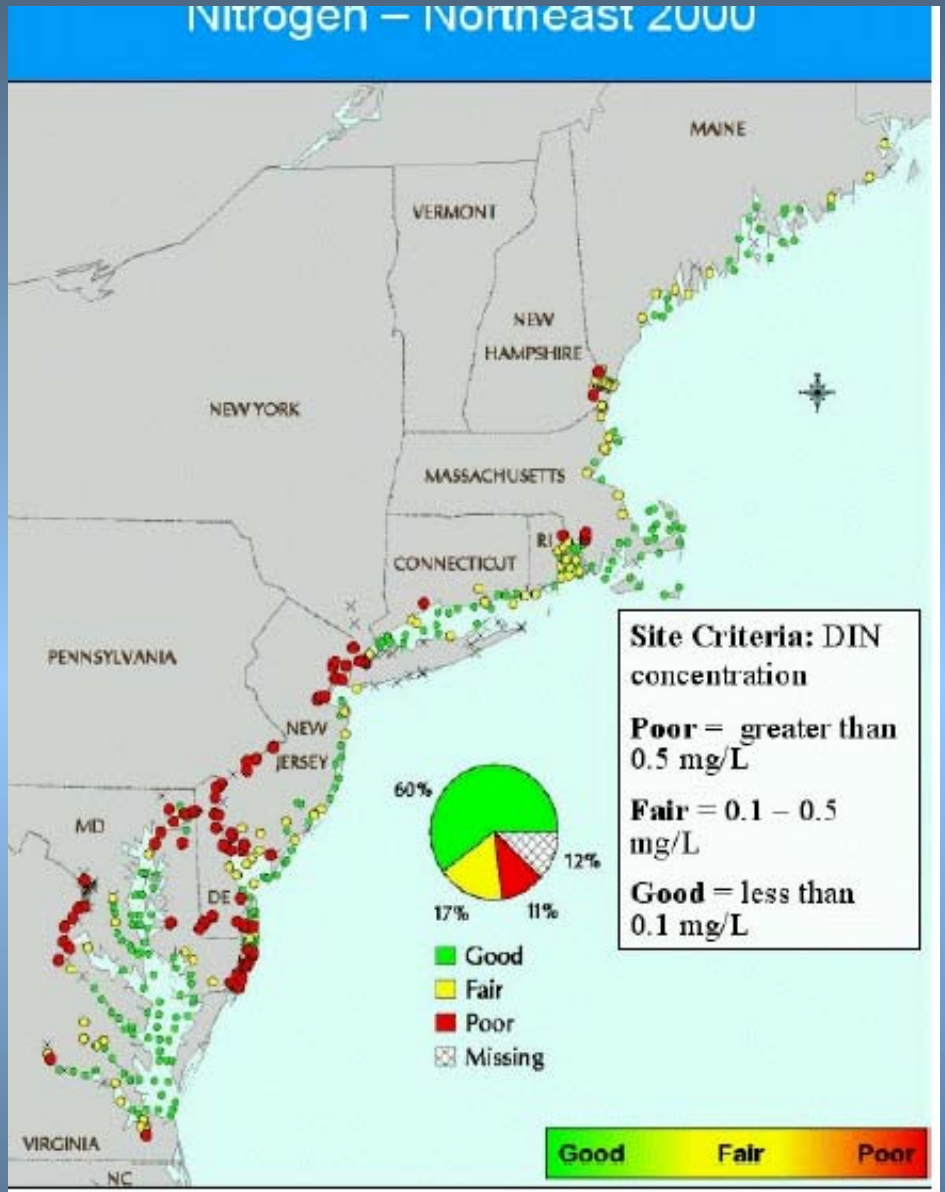


Figure 3-5. DIN concentration data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft.

NCA's highest dissolved inorganic nitrogen levels are seen in the upper Delaware Estuary and in Raritan River and Newark Bay areas. These data are consistent with NJDEP data. However, DEP's data is yearround and shows that higher levels of inorganic nitrogen are seen in the winter and early spring.

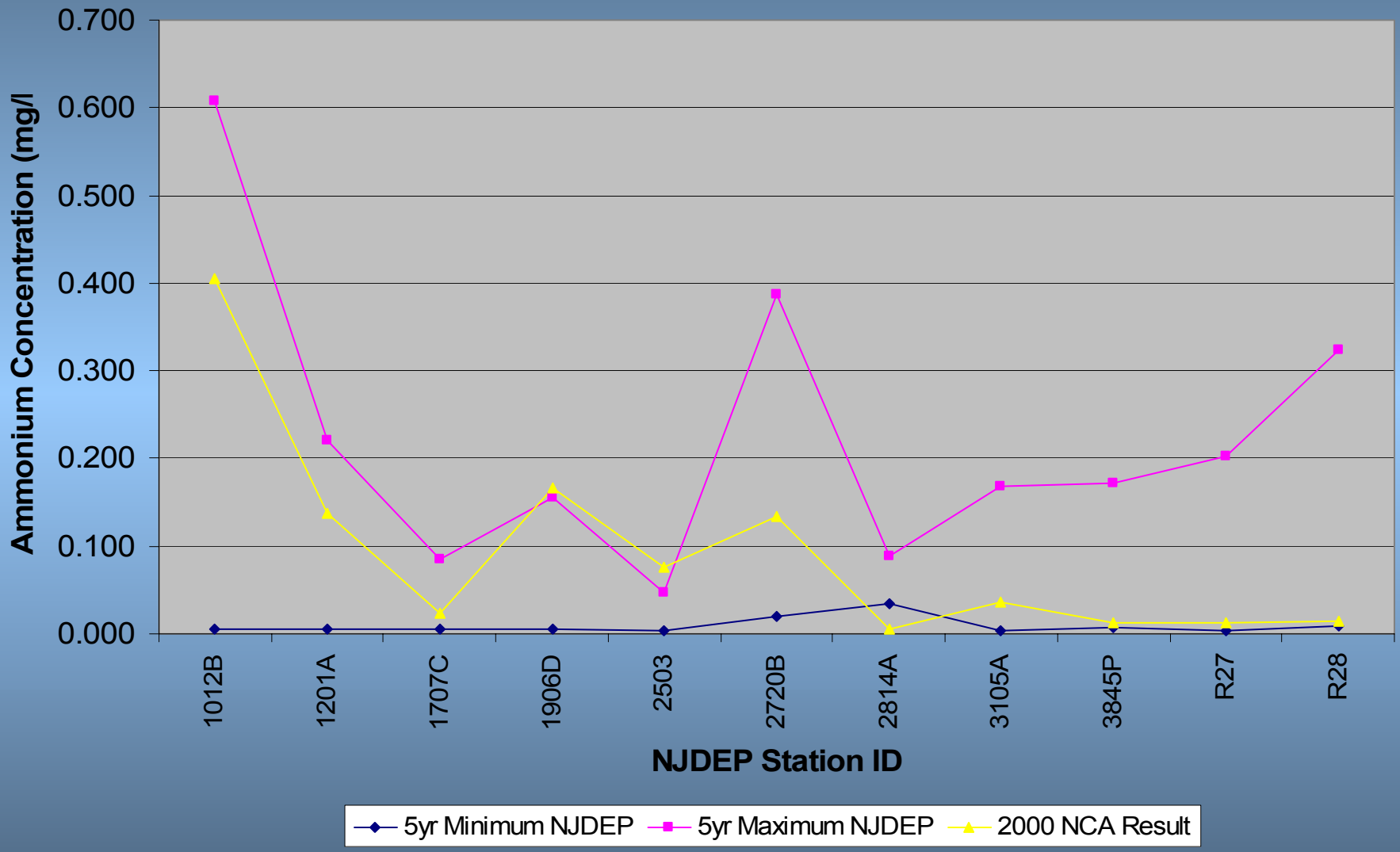
Tools

ArcExplorer Map

Excel Map

View Data

Surface Ammonium Concentration NJDEP Data vs. NCA Data



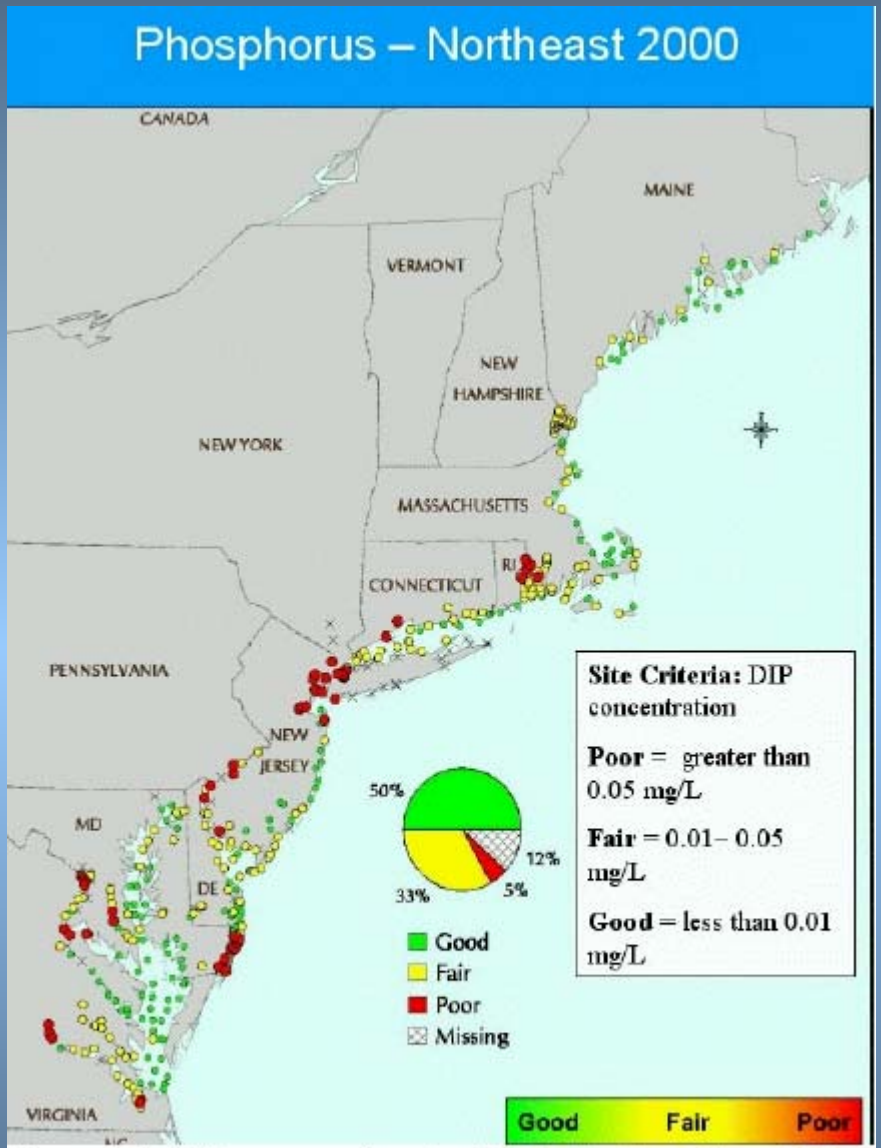


Figure 3-6. DIP concentration data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft.

Similar pattern to Nitrogen. However, most estuarine waters are not phosphorus limited. Primary productivity in these waters is typically light or nitrogen limited.

Tools

ArcExplorer Map

Excel Map

View Data

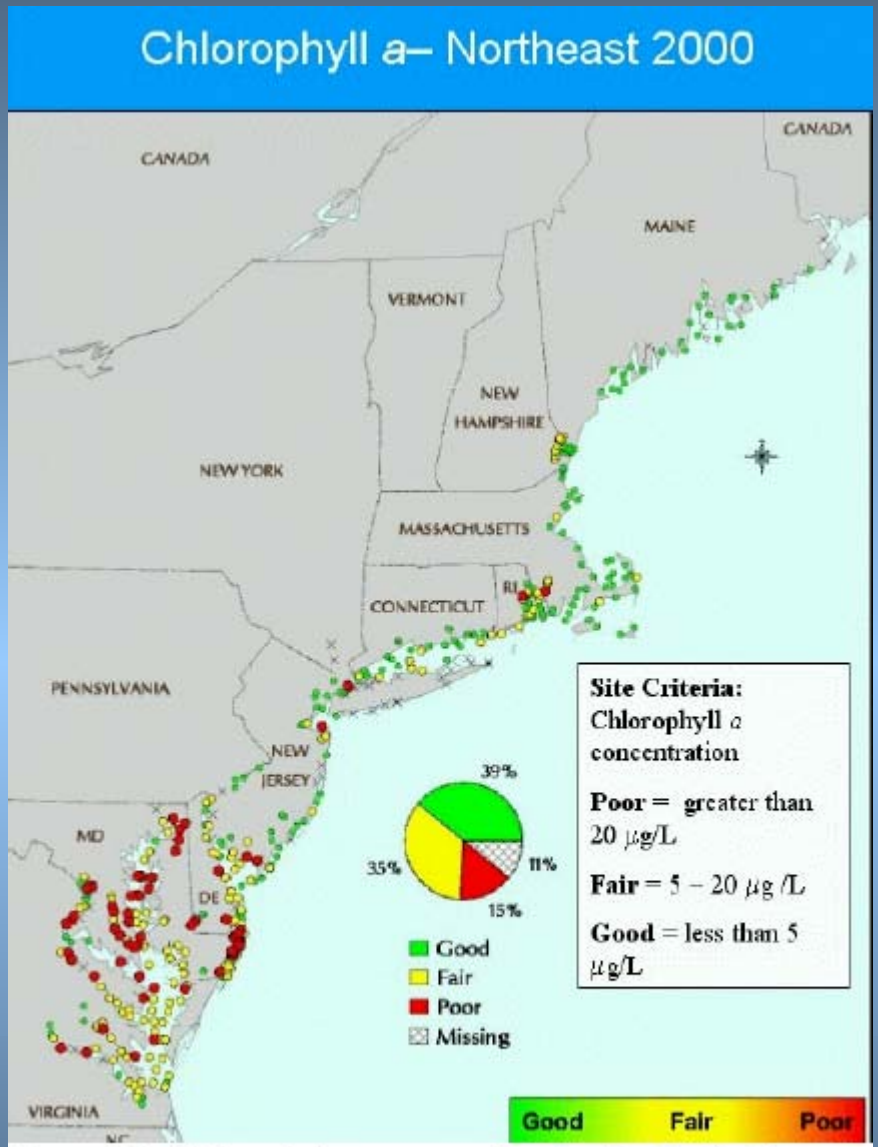


Figure 3-7. Chlorophyll *a* concentration data for the Northeast Coast (U.S. EPA/NCA). ***Note:*** X's denote missing data and will be replaced with blue circles in next draft.

NCA's highest levels are seen in Sandy Hook Bay and Delaware Bay (Maurice River Cove area). NJDEP's monitoring shows highest chlorophyll a levels to occur in the Spring, not in August when NCA sampling took place. The maximum concentration measured by NCA was 32 µg/L in August. NJDEP has measured chlorophyll a levels above 100 µg/L in some Spring samples.

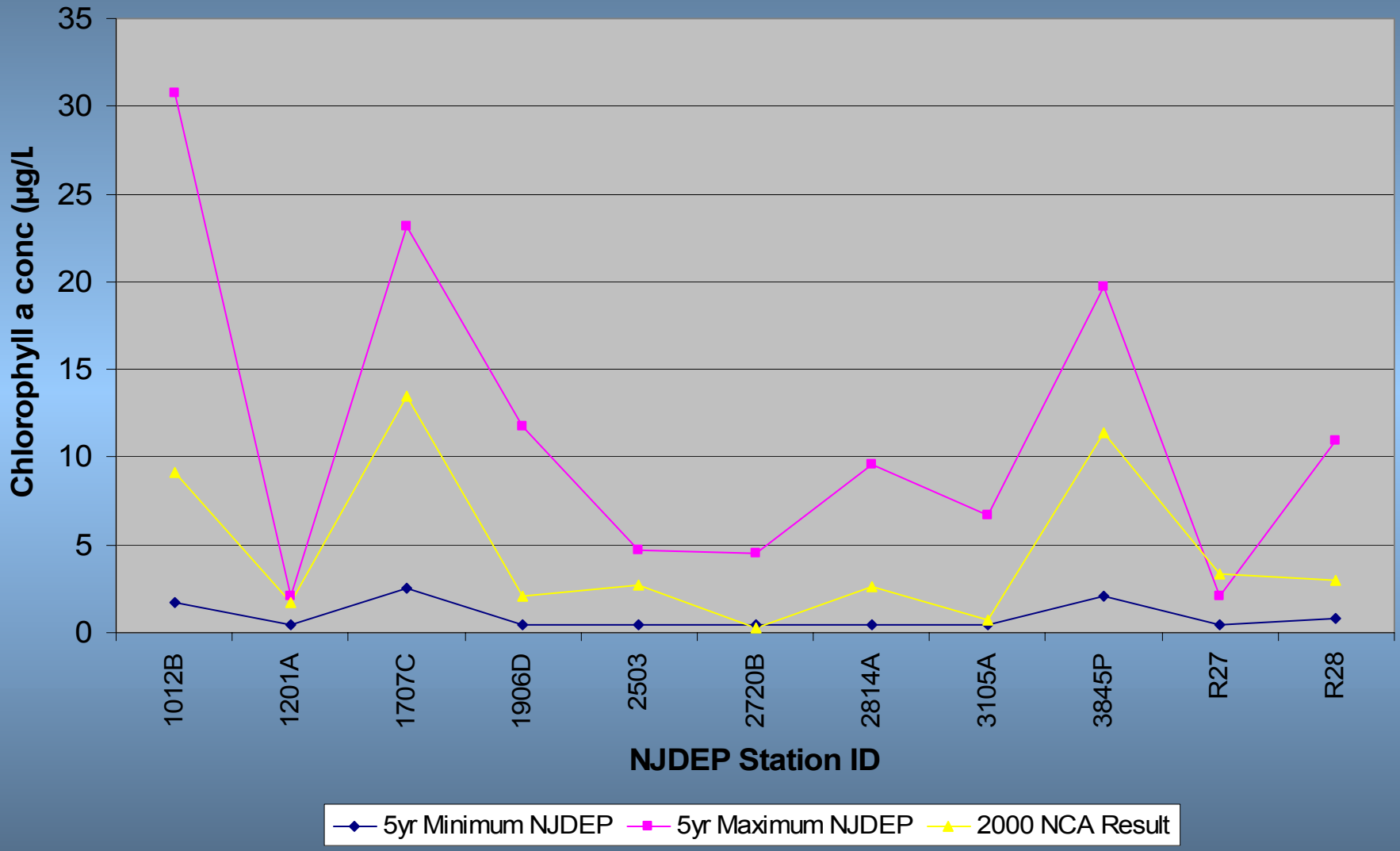
Tools

ArcExplorer Map

Excel Map

View Data

Surface Chlorophyll a concentration NJDEP Data vs. NCA Data



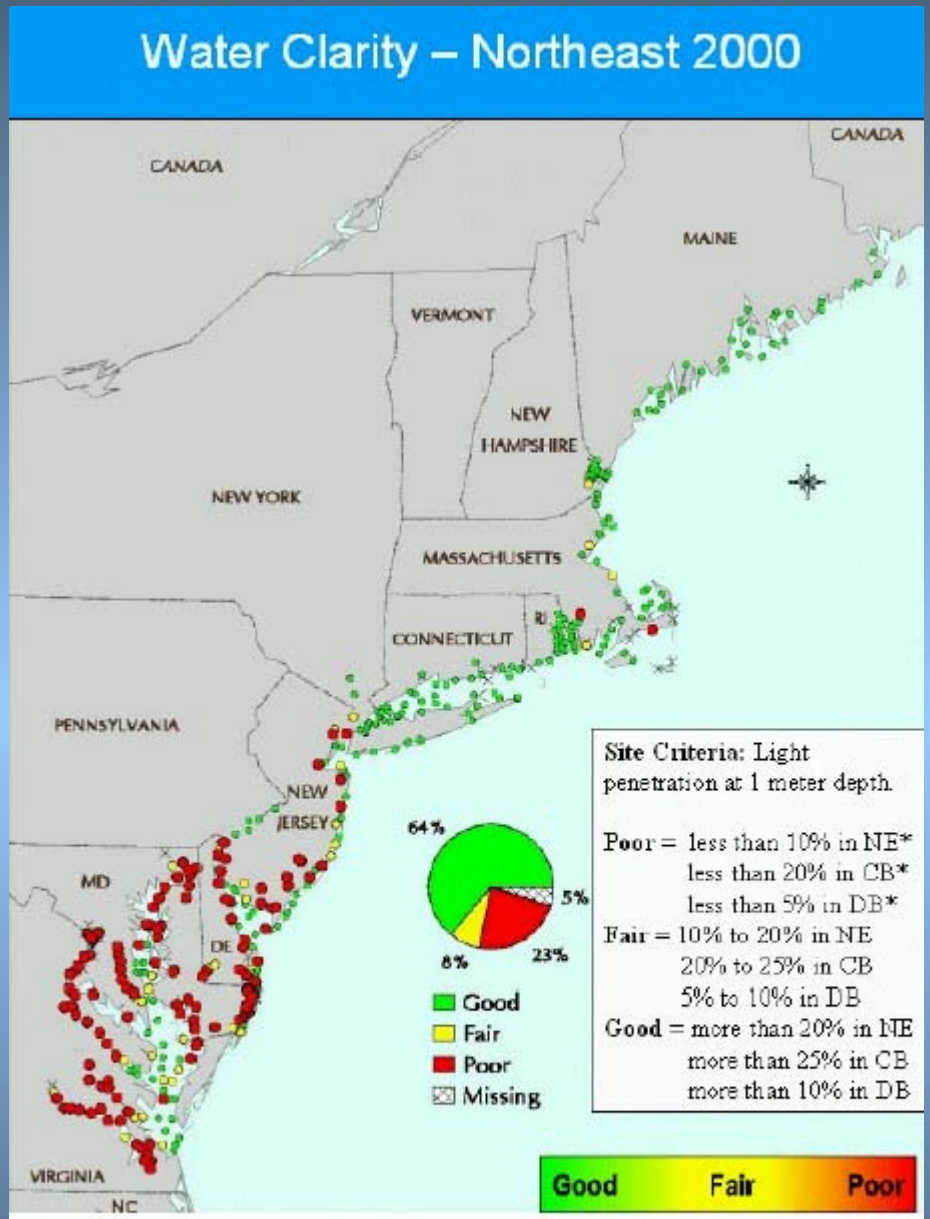


Figure 3-8. Water clarity data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft. *NE represents sampling sites in the Northeast Coast region except for those sites located in Chesapeake Bay (CB) or Delaware River/Bay (DB).

NJ, DE, MD and VA had the majority of the locations in the Northeast with relatively poor levels of light penetration. This is primarily due to geologic and hydrographic conditions. These four states have relatively shallow bays with fine sediments that are easily resuspended by tidal or wind-driven currents. Many NJ locations with poor water clarity were located in tidal tributaries to coastal bays.

Tools

ArcExplorer Map

Excel Map

View Data

Water Quality Summary

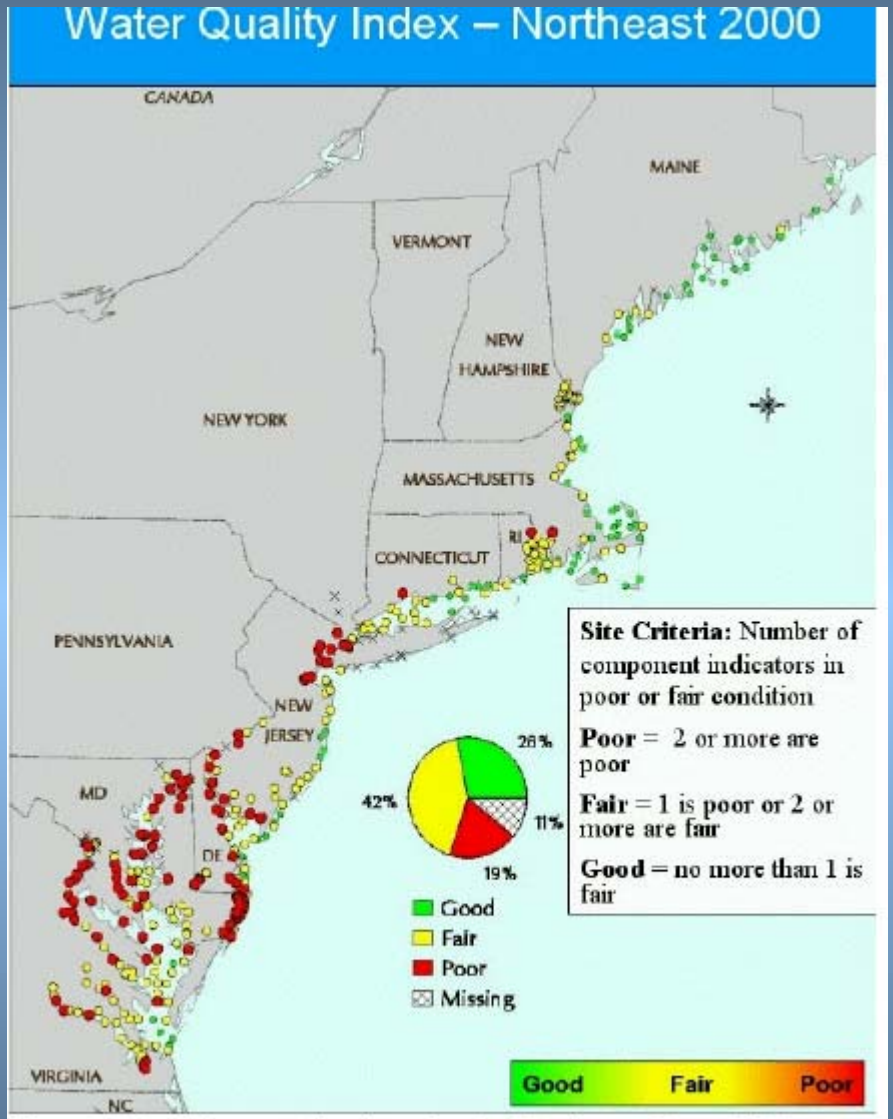


Figure 3-4. Water quality data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft.

Most NJ sites had <2 component indicators in the "Poor" category. Therefore NJ's waters overall ranked "Fair". Oxygen levels and chlorophyll levels were generally good. This was offset by water clarity and nitrogen levels where numerous sites were ranked as "Poor".

With NJ's existing program providing comparable data with a larger sample size, NCA may consider spending WQ effort on other parameters.

Sediment Quality

Long & Morgan
ERM & ERL Definitions

Sediment Contaminant Criteria
(Long et al., 1995)

ERM (Effects Range Median)—Determined for each chemical as the 50th percentile (median) in a database of ascending concentrations associated with adverse biological effects.

ERL (Effects Range Low)—Determined values for each chemical as the 10th percentile in a database of ascending concentrations associated with adverse biological effects.

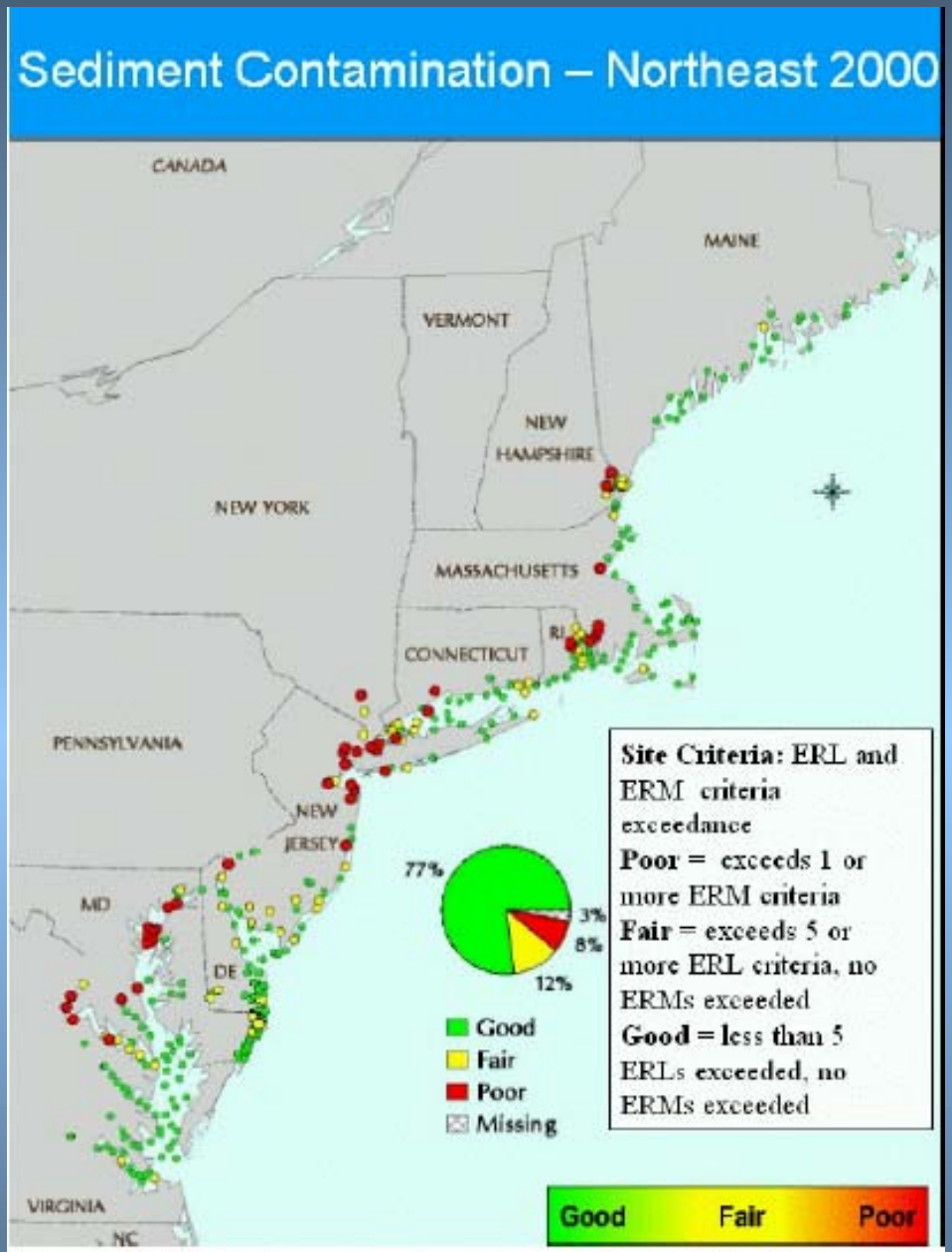


Figure 3-12. Sediment contamination data for the Northeast Coast (U.S. EPA/NCA).

Most of NJ's waters ranked "Good" to "Fair" for sediment contamination. One exception was the NY/NJ Harbor area where numerous "Poor" sites occurred.

Tools

ArcExplorer Map

Excel Map

View Data

ArcView GIS 3.2

File Edit View Theme Graphics Window Help

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524,494.39
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View2

- Sed Toxicity
- Sed Chem
- Nutrients
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- ERM/ERL
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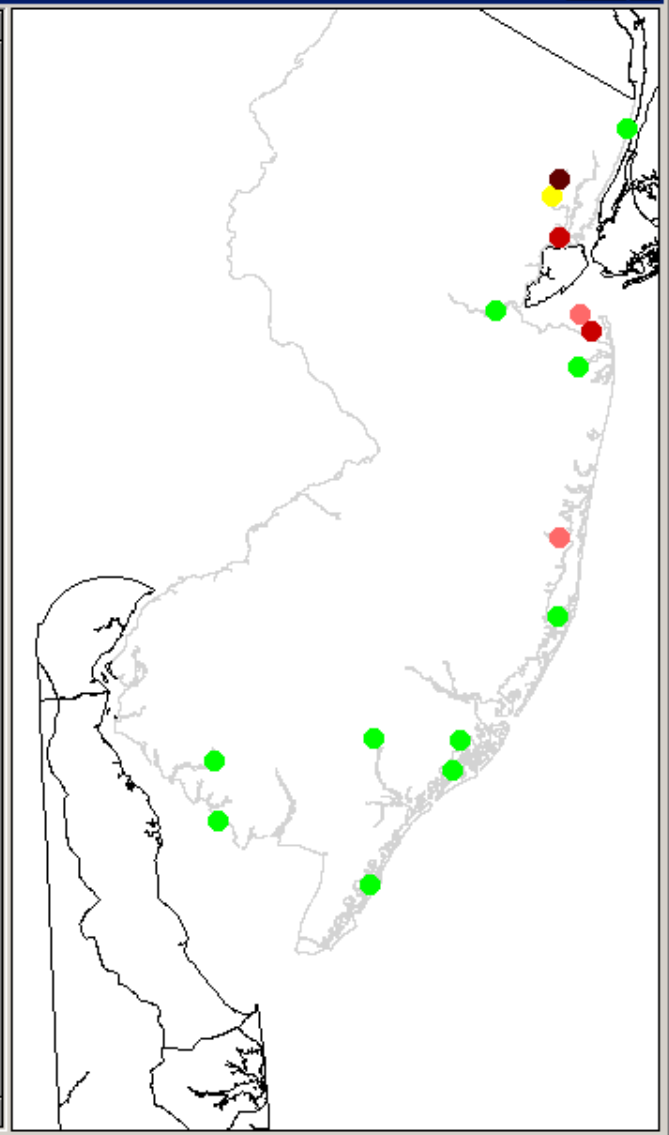
- Coast.shp
- Newyork.shp



SedChemERLM

STATION	ANALYTE	Result	OverERL	ERL	OverERM	ERM
NJ00-0011	HG	2.360000	15.733333	0.150000	3.323944	0.71000
NJ00-0011	DIBENZ	0.540000	8.571429	0.063000	2.076923	0.26000
NJ00-0011	PPDDE	0.052000	23.636364	0.002200	1.925926	0.02700
NJ00-0011	BENAPY	2.700000	6.279070	0.430000	1.687500	1.60000
NJ00-0011	ZN	631.000000	4.206667	150.000000	1.539024	410.00000
NJ00-0011	PYRENE	4.000000	6.015038	0.665000	1.538462	2.60000
NJ00-0011	BENANTH	2.100000	8.045977	0.261000	1.312500	1.60000
NJ00-0011	AG	4.500000	4.500000	1.000000	1.216216	3.70000
NJ00-0011	PB	241.000000	5.127660	47.000000	1.105505	218.00000
NJ00-0011	CHRYSENE	2.800000	7.291667	0.384000	1.000000	2.80000
NJ00-0011	NI	49.000000	2.333333	21.000000	0.942308	52.00000
NJ00-0011	FLUORANT	4.200000	7.000000	0.600000	0.823529	5.10000
NJ00-0011	CU	206.000000	6.058824	34.000000	0.762963	270.00000
NJ00-0011	ANTHRA	0.570000	6.705882	0.085000	0.518182	1.10000
NJ00-0011	CR	190.000000	2.345679	81.000000	0.513514	370.00000
NJ00-0011	CD	4.700000	3.916667	1.200000	0.489583	9.60000
NJ00-0011	ACENTHY	0.270000	6.136364	0.044000	0.421875	0.64000
NJ00-0011	FLUORENE	0.190000	10.000000	0.019000	0.351852	0.54000
NJ00-0011	ACENTHE	0.150000	9.375000	0.016000	0.300000	0.50000
NJ00-0011	MENAP2	0.120000	1.714286	0.070000	0.179104	0.67000
NJ00-0011	AS	7.000000	0.853659	8.200000	0.100000	70.00000
NJ00-0011	NAPH	0.160000	1.000000	0.160000	0.076190	2.10000
NJ00-0011	INDENO	2.000000	10.000000	0.200000	0.006250	320.00000
NJ00-0011	HEPTAEPO	0.005900	1.180000	0.005000	0.001180	5.00000
NJ00-0011	BENZOKFL	1.300000	5.416667	0.240000	0.000970	1340.00000
NJ00-0011	DIELDRIN	0.012000	6.000000	0.002000	0.000132	91.00000
NJ00-0013	PYRENE	14.000000	21.052632	0.665000	5.384615	2.60000
NJ00-0013	BENAPY	7.700000	17.906977	0.430000	4.812500	1.60000
NJ00-0013	BENANTH	7.500000	28.735632	0.261000	4.687500	1.60000
NJ00-0013	ANTHRA	4.200000	49.411765	0.085000	3.818182	1.10000
NJ00-0013	FLUORENE	1.700000	89.473684	0.019000	3.148148	0.54000
NJ00-0013	DIBENZ	0.790000	12.539683	0.063000	3.038462	0.26000
NJ00-0013	FLUORANT	15.000000	25.000000	0.600000	2.941176	5.10000
NJ00-0013	ACENTHE	1.300000	81.250000	0.016000	2.600000	0.50000
NJ00-0013	CHRYSENE	6.900000	17.968750	0.384000	2.464286	2.80000

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ArcView GIS 3.2

File Edit Table Field Window Help

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View2

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- Sed Chem
- Nutrients
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  - -2 - -1
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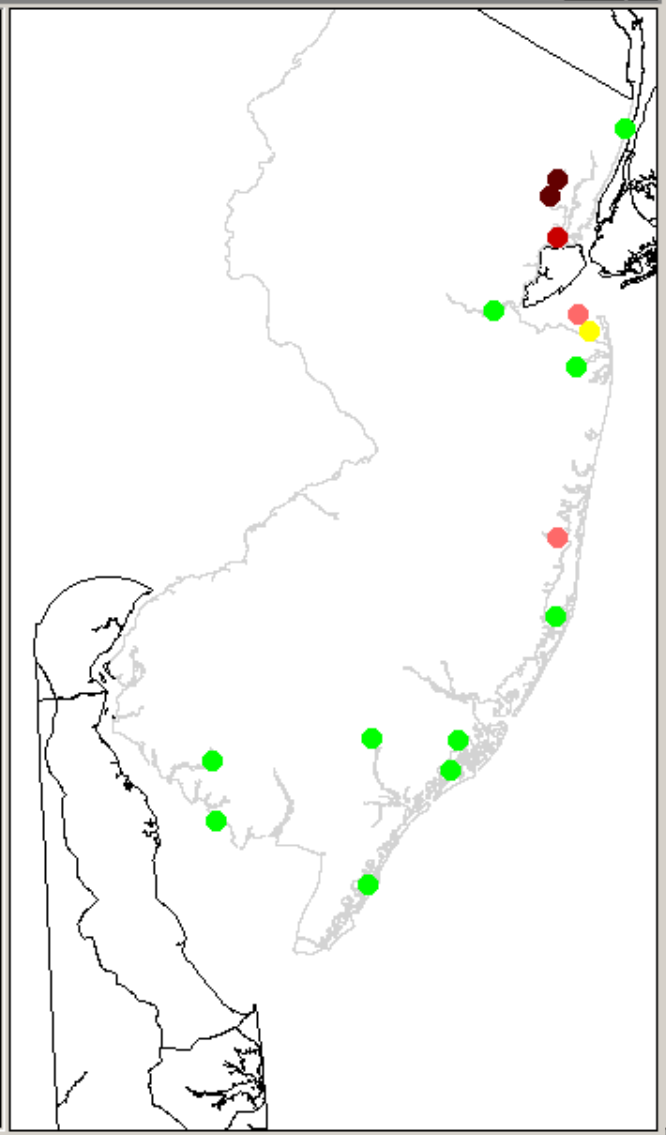
- Newyork.shp



SedChemERLM

STATION	ANALYTE	Result	OverERL	ERL	OverERM	ERM
NJ00-0003	HG	1.700000	11.333333	0.150000	2.394366	0.71000
NJ00-0003	AG	4.000000	4.000000	1.000000	1.081081	3.70000
NJ00-0003	ZN	360.000000	2.400000	150.000000	0.878049	410.00000
NJ00-0003	NI	45.000000	2.142857	21.000000	0.865385	52.00000
NJ00-0003	PB	140.000000	2.978723	47.000000	0.642202	218.00000
NJ00-0003	CU	150.000000	4.411765	34.000000	0.555556	270.00000
NJ00-0003	CR	170.000000	2.098765	81.000000	0.459459	370.00000
NJ00-0003	PPDDE	0.010000	4.545455	0.002200	0.370370	0.02700
NJ00-0003	AS	20.000000	2.439024	8.200000	0.285714	70.00000
NJ00-0003	DIBENZ	0.073000	1.158730	0.063000	0.280769	0.26000
NJ00-0003	BENAPY	0.440000	1.023256	0.430000	0.275000	1.60000
NJ00-0003	PYRENE	0.640000	0.962406	0.665000	0.246154	2.60000
NJ00-0003	BENANTH	0.330000	1.264368	0.261000	0.206250	1.60000
NJ00-0003	CD	1.400000	1.166667	1.200000	0.145833	9.60000
NJ00-0003	CHRYSENE	0.380000	0.989583	0.384000	0.135714	2.80000
NJ00-0003	ANTHRA	0.120000	1.411765	0.085000	0.109091	1.10000
NJ00-0003	ACENTHY	0.067000	1.522727	0.044000	0.104688	0.64000
NJ00-0003	FLUORANT	0.520000	0.866667	0.600000	0.101961	5.10000
NJ00-0003	MENAP2	0.049000	0.700000	0.070000	0.073134	0.67000
NJ00-0003	FLUORENE	0.039000	2.052632	0.019000	0.072222	0.54000
NJ00-0003	ACENTHE	0.022000	1.375000	0.016000	0.044000	0.50000
NJ00-0003	NAPH	0.061000	0.381250	0.160000	0.029048	2.10000
NJ00-0003	INDENO	0.340000	1.700000	0.200000	0.001063	320.00000
NJ00-0003	BENZOKFL	0.220000	0.916667	0.240000	0.000164	1340.00000
NJ00-0003	DIELDRIN	0.001400	0.700000	0.002000	0.000015	91.00000
NJ00-0003	MIREX	0.000540	0.077143	0.007000	0.000004	130.00000
NJ00-0011	HG	2.360000	15.733333	0.150000	3.323944	0.71000
NJ00-0011	DIBENZ	0.540000	8.571429	0.063000	2.076923	0.26000
NJ00-0011	PPDDE	0.052000	23.636364	0.002200	1.925926	0.02700
NJ00-0011	BENAPY	2.700000	6.279070	0.430000	1.687500	1.60000
NJ00-0011	ZN	631.000000	4.206667	150.000000	1.539024	410.00000
NJ00-0011	PYRENE	4.000000	6.015038	0.665000	1.538462	2.60000
NJ00-0011	BENANTH	2.100000	8.045977	0.261000	1.312500	1.60000
NJ00-0011	AG	4.500000	4.500000	1.000000	1.216216	3.70000
NJ00-0011	PB	241.000000	5.127660	47.000000	1.105505	218.00000

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ArcView GIS 3.2

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View2

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- Nutrients
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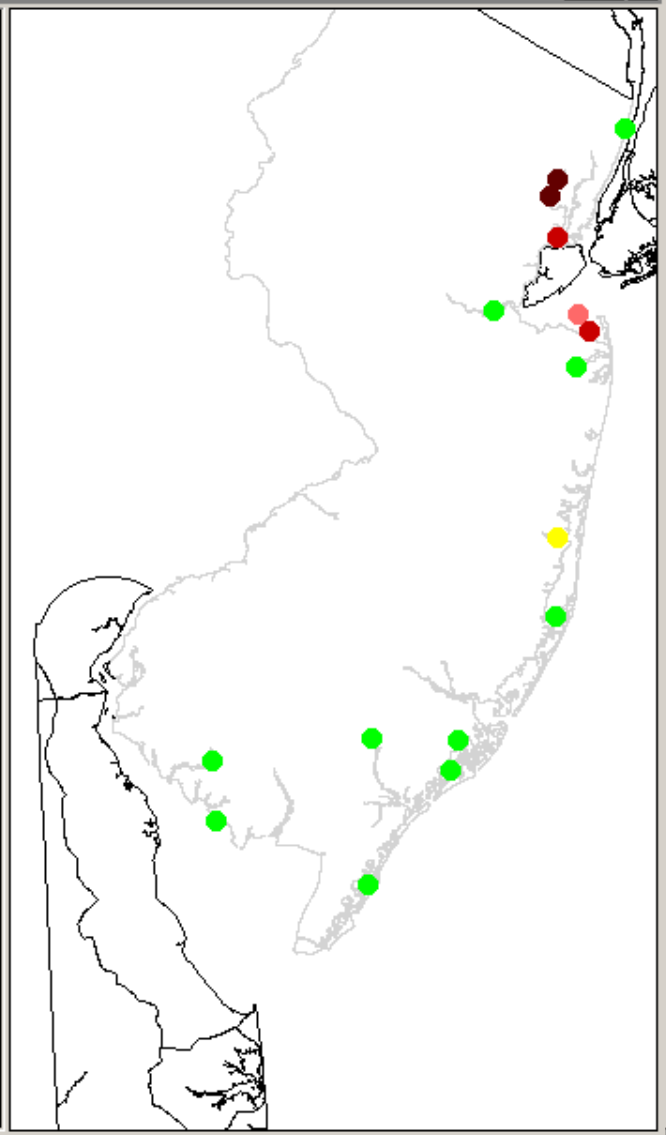

SedChemERLM

STATION	ANALYTE	Result	OverERL	ERL	OverERM	ERM
NJ00-0049	HG	0.970000	6.466667	0.150000	1.366197	0.71000
NJ00-0049	ZN	249.000000	1.660000	150.000000	0.607317	410.00000
NJ00-0049	NI	28.000000	1.333333	21.000000	0.538462	52.00000
NJ00-0049	PB	79.300000	1.687234	47.000000	0.363761	218.00000
NJ00-0049	AS	19.000000	2.317073	8.200000	0.271429	70.00000
NJ00-0049	CU	58.000000	1.705882	34.000000	0.214815	270.00000
NJ00-0049	CR	79.000000	0.975309	81.000000	0.213514	370.00000
NJ00-0049	PPDDE	0.005700	2.590909	0.002200	0.211111	0.02700
NJ00-0049	AG	0.600000	0.600000	1.000000	0.162162	3.70000
NJ00-0049	PYRENE	0.190000	0.285714	0.665000	0.073077	2.60000
NJ00-0049	DIBENZ	0.015000	0.238095	0.063000	0.057692	0.26000
NJ00-0049	BENAPY	0.090000	0.209302	0.430000	0.056250	1.60000
NJ00-0049	CD	0.440000	0.366667	1.200000	0.045833	9.60000
NJ00-0049	BENANTH	0.072000	0.275862	0.261000	0.045000	1.60000
NJ00-0049	FLUORANT	0.200000	0.333333	0.600000	0.039216	5.10000
NJ00-0049	CHRYSENE	0.100000	0.260417	0.384000	0.035714	2.80000
NJ00-0049	ANTHRA	0.025000	0.294118	0.085000	0.022727	1.10000
NJ00-0049	ACENTHY	0.013000	0.295455	0.044000	0.020312	0.64000
NJ00-0049	FLUORENE	0.005200	0.273684	0.019000	0.009630	0.54000
NJ00-0049	MENAP2	0.005700	0.081429	0.070000	0.008507	0.67000
NJ00-0049	ACENTHE	0.002200	0.137500	0.016000	0.004400	0.50000
NJ00-0049	NAPH	0.006400	0.040000	0.160000	0.003048	2.10000
NJ00-0049	INDENO	0.079000	0.395000	0.200000	0.000247	320.00000
NJ00-0049	BENZOKFL	0.057000	0.237500	0.240000	0.000043	1340.00000
NJ00-0003	HG	1.700000	11.333333	0.150000	2.394366	0.71000
NJ00-0003	AG	4.000000	4.000000	1.000000	1.081081	3.70000
NJ00-0003	ZN	360.000000	2.400000	150.000000	0.878049	410.00000
NJ00-0003	NI	45.000000	2.142857	21.000000	0.865385	52.00000
NJ00-0003	PB	140.000000	2.978723	47.000000	0.642202	218.00000
NJ00-0003	CU	150.000000	4.411765	34.000000	0.555556	270.00000
NJ00-0003	CR	170.000000	2.098765	81.000000	0.459459	370.00000
NJ00-0003	PPDDE	0.010000	4.545455	0.002200	0.370370	0.02700
NJ00-0003	AS	20.000000	2.439024	8.200000	0.285714	70.00000
NJ00-0003	DIBENZ	0.073000	1.158730	0.063000	0.280769	0.26000
NJ00-0003	BENAPY	0.440000	1.023256	0.430000	0.275000	1.60000

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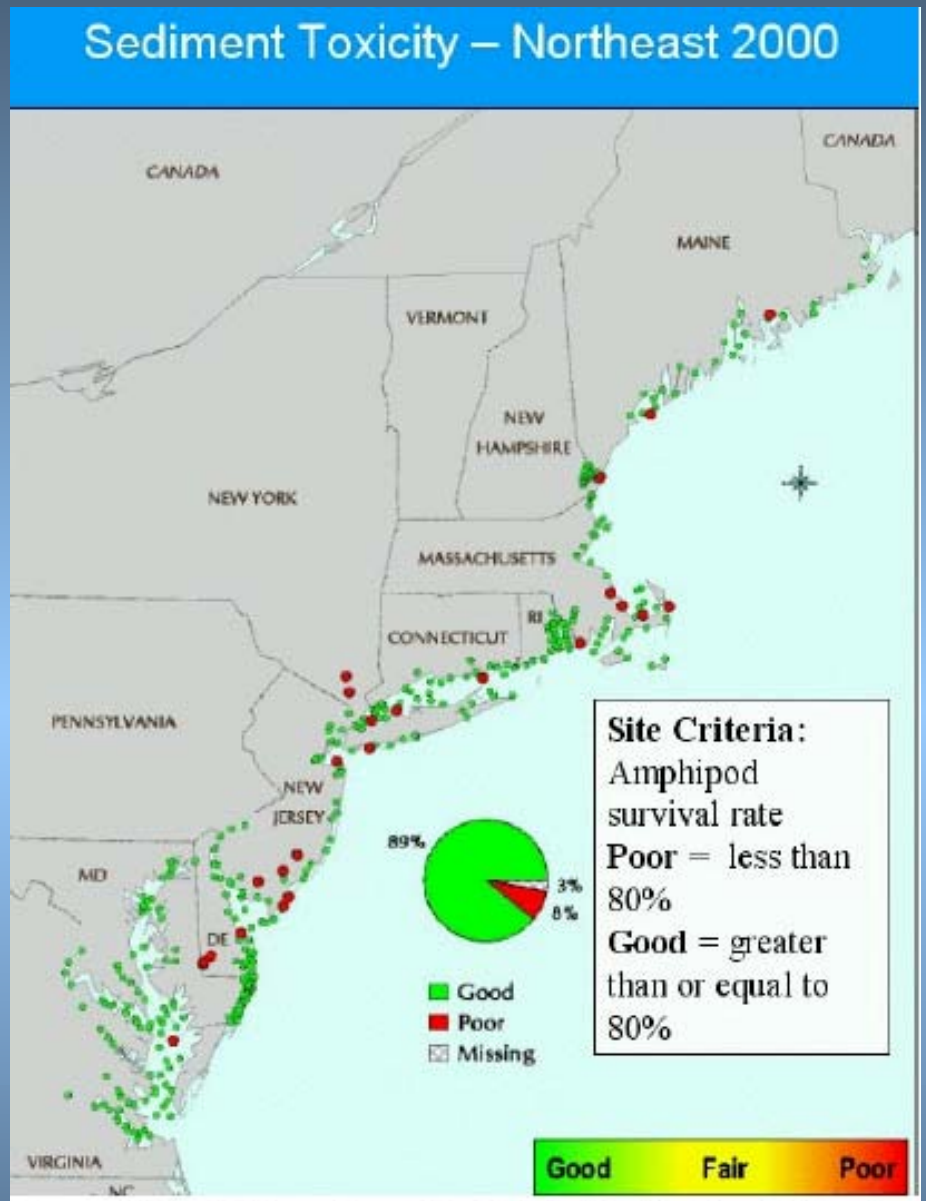
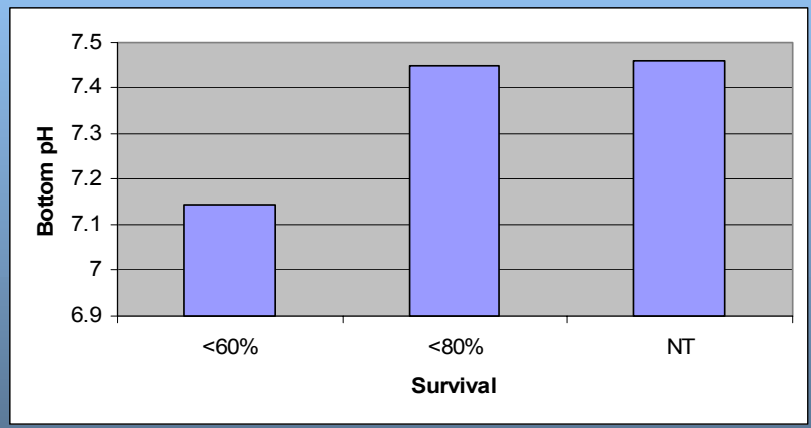
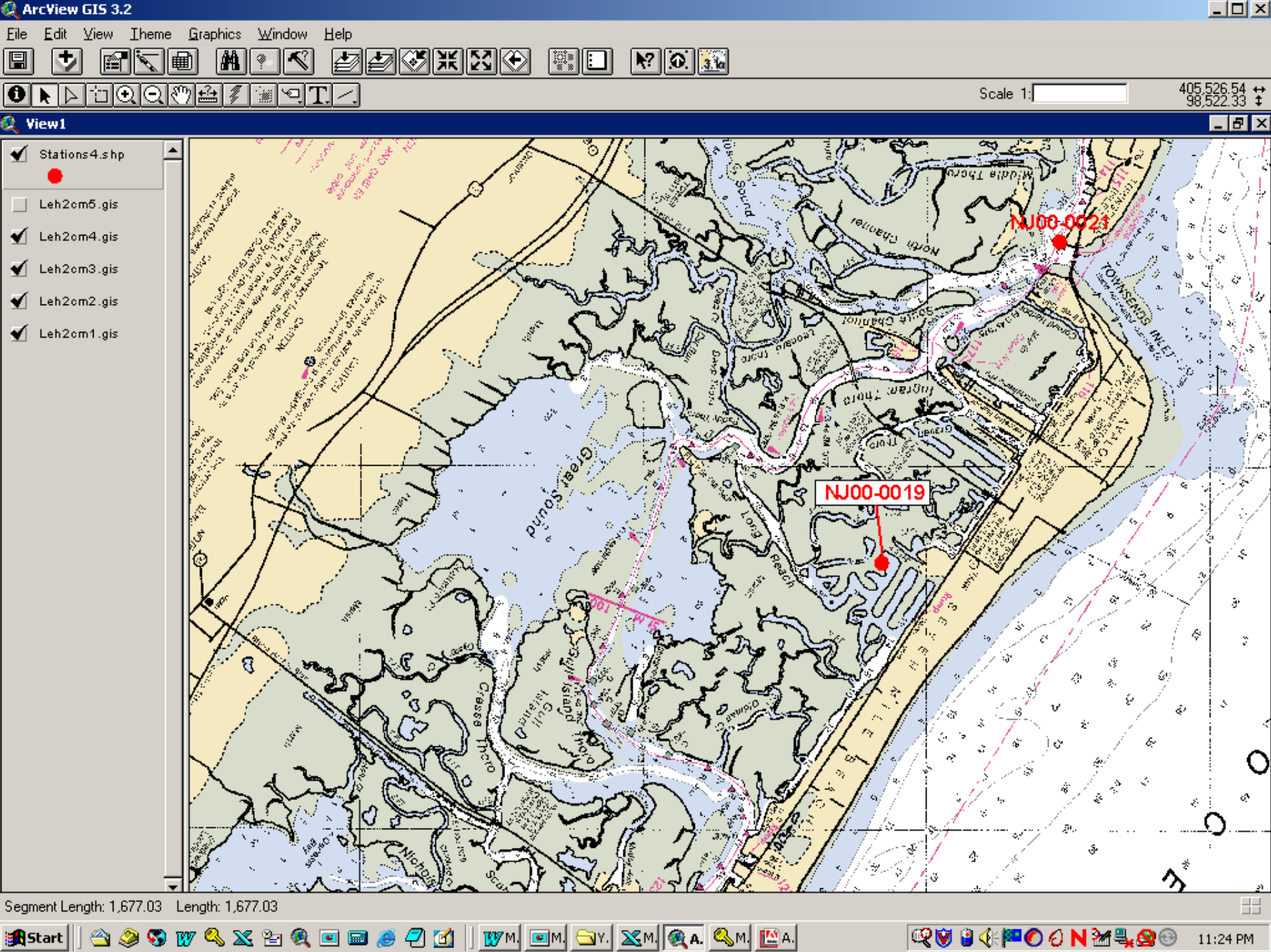


Figure 3-11. Sediment toxicity data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft.

Does not correlate with sediment contaminant data. Toxic sites at head of tide in southern tributaries and in man-made canal in southern NJ.

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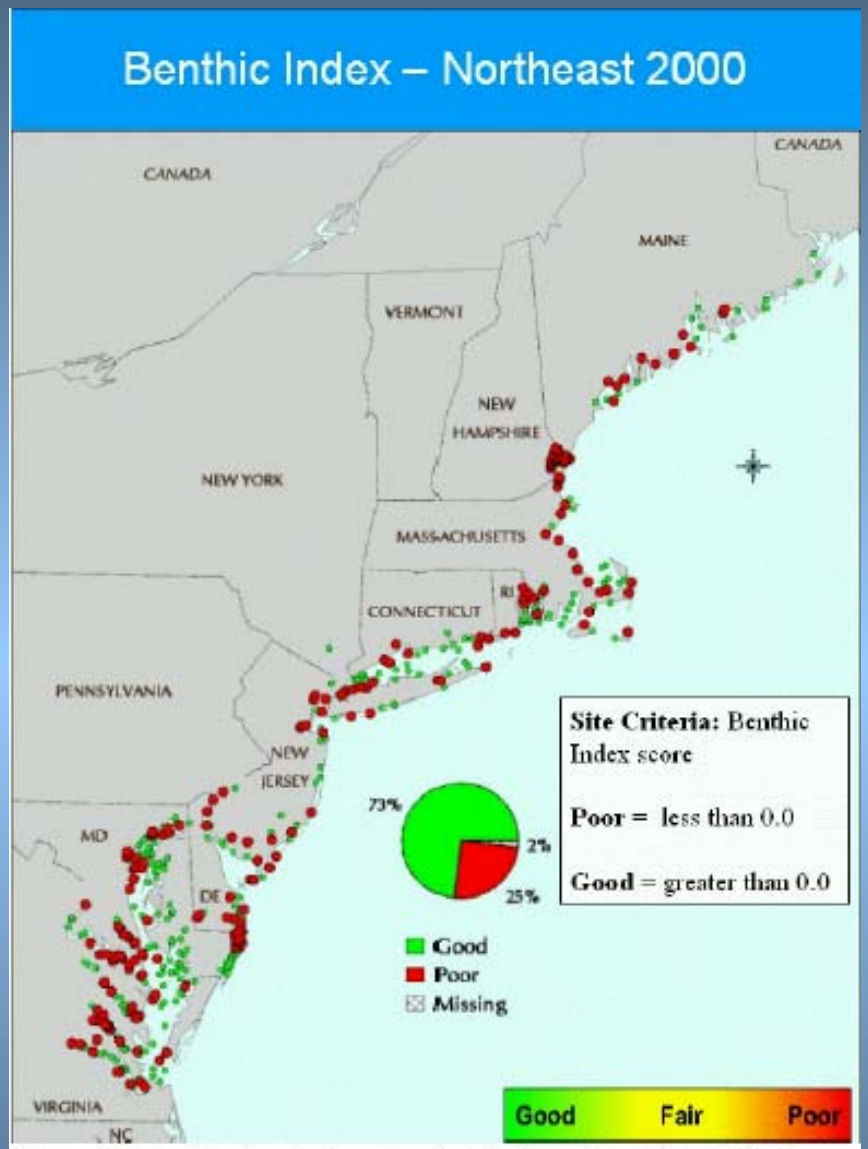

Figure 3-14. Benthic index data for the Northeast Coast (U.S. EPA/NCA). *Note:* X's denote missing data and will be replaced with blue circles in next draft.

Metrics for these data?

STATION	LEVEL	COUNT
NJ00-0001	Class	1
NJ00-0001	Family	3
NJ00-0001	Genus	3
NJ00-0001	Order	1
NJ00-0001	Species	3
NJ00-0003	Family	6
NJ00-0003	Genus	5
NJ00-0003	Phylum	1
NJ00-0003	Species	31
NJ00-0005	Class	1
NJ00-0005	Family	3
NJ00-0005	Genus	2
NJ00-0005	Species	6
NJ00-0007	Class	1
NJ00-0007	Family	2
NJ00-0007	Genus	3
NJ00-0007	Species	15

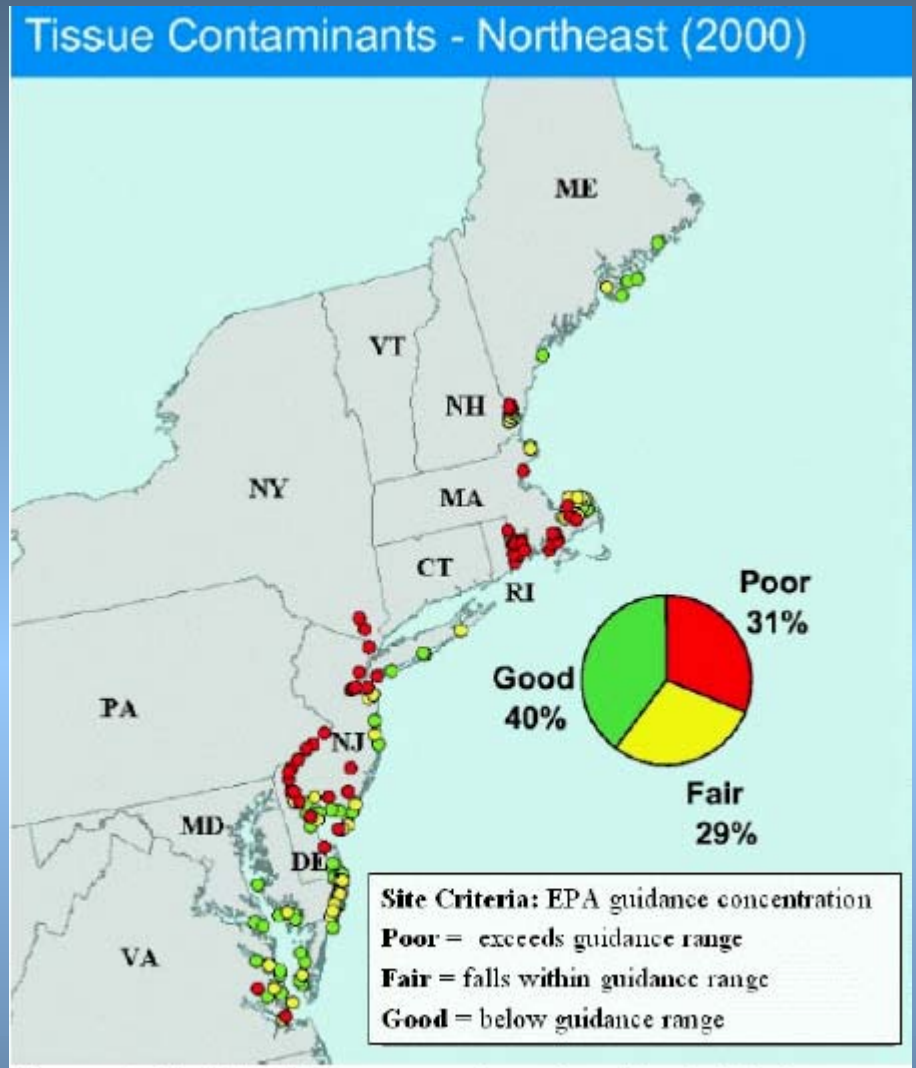

Figure 3-16. Fish tissue contaminant data for the Northeast Coast (U.S. EPA/NCA). ***Note:*** X's denote missing data and will be replaced with blue circles in next draft.

Fisheries Data in Report

- Very broad, regional assessment
- Info appears to be gleaned from National Marine Fisheries Service "Status of the Stocks" reports. Citations would be helpful.
- Info consistent with NJ data
- Report addresses only commercial fisheries, but recreational fisheries are also very valuable and important

NJ Recommendations for Future NCA Efforts

- Drop Water Column efforts and redirect funds to other areas of need
- Ocean assessments? Biological, sed chem, sed toxicity?
- Further study of sites where ERM's exceeded or toxicity was apparent.